solar radiation, together with those parts of the atmosphere which are warmed directly by solar radiation; such conditions are particularly marked in tropical regions The "condenser" is any part of the surface of land or sea colder than the air above it, and any part of the atmosphere which is, in the net, losing heat by radiation; these conditions are most effectively present in the vast cooling surfaces of the arctic and antarctic regions. The atmosphere as a whole does no useful work—the atmospheric engine has an efficiency zero—for most of the work done is turned into heat by friction and turbulence in the air and the ocean, and ultimately radiated away. Hence in the long run there is a balance between incoming effective solar radiation and outgoing earth radiation; this necessarily follows from the fact that no part of the earth is continuously increasing or decreasing in temperature. Since in the long run the total thermal effect is immeasurably small, the solar energy which passes through the atmosphere merely maintaining the *status quo ante*, we can not deal with the relation between heat and work by regarding the whole atmosphere as a unit. The dynamical effects attributed to the heating by solar radiation combined with the cooling by earth radiation are dependent upon the differential treatment of separate parts of the atmosphere; we must therefore suppose a portion of air to be isolated, and trace the thermal changes which it undergoes.

Until comparatively recently, the manner in which the atmospheric engine works seemed to present little difficulty: The general circulation was considered to be the direct consequence of ascent of warm air at the equator and descent of cold air at the poles, there being a permanent circulation from equator to poles in the upper atmosphere, with a return flow in the surface or middle layers. Similarly, cyclones were considered to form in regions where the air was warmer than the surrounding air, with a consequent upward motion of the warm air through its colder environment; and the anticyclone was considered to be a region of cold descending air (*9*). However, we now know that the atmosphere is thermally stratified and hence normally restrains large-scale vertical circulations, that there is no direct and regular exchange of air between polar and equatorial regions either at the surface or aloft, that some cyclones are relatively cold and some anticyclones relatively warm; and we recognize many puzzling phenomena in connection with ordinary thermal convection. We are thus called upon profoundly to modify many of our simple conceptions and to solve many new problems (*9*).

Probably most of the radiant energy from the sun is first converted into some form of potential energy which is subsequently released in the form of kinetic energy, very little solar energy being converted directly into the kinetic form. The well-known mechanism of conversion suggested by Margules (*10*) however, is considered by Brunt to be more applicable to thunderstorms and line squalls than to the general circulation. The transference of solar energy into kinetic energy may in part be brought about through the ascent of warm humid air within the Tropics, the ascended air moving poleward aloft, but being able to descend in middle latitudes in spite of the thermal stratification on account of cooling by radiation. It completes a cycle by moving equatorward over the surface (*11*); the amount of work done in the course of such a cycle has been computed by Shaw (*12*). Certainly the abundant rains of the doldrums (and other regions) are definite evidence that convection is operative in the atmosphere on a large scale; and the ascent of the relatively small quantity of 100 cubic kilometers of air per second to 15 kilometers, this air drifting north, cooling by radiation, descending in latitude 60°, and returning equatorward, would contribute just enough kinetic energy to the general circulation to replace the energy dissipated by turbulence. The descent of cold air over the slopes of Greenland and the Antarctic continent would also contribute some energy, but the computations of L. F. Richardson indicate that the amount so contributed can be only a very small fraction of that dissipated (*5*).

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## CONFERENCE OF THE INTERNATIONAL COMMISSION ON SOLAR RADIATION AT DAVOS AUGUST 31 TO SEPTEMBER 2, 1925 [1]

551.590.2 (682.2)

By H. H. KIMBALL

There were present at the conference the following persons, who were, except the last named, members of the commission: Messrs. J. Maurer, the president; A. Ångström, Stockholm; C. Dorno, Davos; L. Gorczyński, Warsaw; H. Hergesell, Lindenberg; Chr. A. Nell, The Hague; C. Schoute, de Bilt; R. Süring, Potsdam; and F. Linke, Frankfort.

Sessions were held on the morning and the afternoon of August 31 and on the mornings of September 1 and 2.

The following were nominated for membership on the Commission: Messrs. Åkerblom, Upsala; Linke, Frankfort; Moll, The Hague; and Volochine, Prague.

Among the important questions considered were the following:

(1) The founding of a Central Institute for Solar Radiation.

(2) Questions of the first importance in solar radiation (standardization of pyrheliometers, transmission coeffi-

[1] Procès Verbaux de la Conférence de la Commission Internationale de Radiation Solaire a Davos 31/8–2/9, 1925.

cients of filters, study of photo-electric cells, study of diffuse radiation and of radiation to the sky, study of ultra-violet radiation, etc.).

(3) The solar constant. The commission expressed its admiration for the important and fruitful work of Doctor Abbot on the measurement of solar radiation and hoped that the means which have been placed at his disposal would permit him to continue his researches at high altitudes with much uccess.

(4) The view was expressed that it is exclusively for the permanent Meteorological Commission to decide upon the relation which should exist between this commission and that of section (c), International Union of Geodesy and Geophysics.

(5) M. Ångström reported on the researches at the observatory of Stockholm, and spoke on the possibility of predicting temperature changes from actinometric measurements.

(6) The question of establishing a publication for actinometric observations and studies was discussed. It was decided to invite "reporters" to summarize for the different countries matters pertaining to actinometry.

The following were designated as "reporters": For Germany, R. Süring; for Poland, Ed. Stenz; for Holland and Belgium, C. Schoute; for the Scandinavian countries, A. Ångström; for America, H. H. Kimball; for France, C. Maurain; for England, W. H. Dines; for Russia, N. N. Kalitin; for Italy, L. Palazzo; for the Iberian Peninsula, F. M. Costa di Lobo; for Australia, E. F. Pigot.

The following resolutions were adopted by the commission:

Resolution I: The commission resolved to address propositions to different institutes asking them to take up certain important actinometric investigations, and decided also to submit to the chiefs of these institutes special recommendations relating thereto.

Resolution II: In consideration of the great importance of the compensation method of K. Ångström, which ought to be used for standardization in actinometric measurements, the International Radiation Commission asks that the Meteorological Hydrographical office at Stockholm and the Physical Institute of the University of Upsala undertake a detailed investigation of the possible sources of error in the instruments concerned and make a report thereon to the president of the commission.

Resolution III: The International Radiation Commission considers it highly important that suitable filters be available for isolating parts of the total radiation in pyrheliometric measurements throughout the range of the solar spectrum and that arrangements be recommended for testing such filters. The commission begs the Netherlands Meteorological Institute (in collaboration with the Physical Institute of the University of Utrecht) and the Meteorological-Geophysical Institute at Frankfort on the Main to undertake these important works.

Resolution IV: The International Radiation Commission considers it highly desirable that the pyrheliometer of K. Ångström, which was accepted at the meeting at Innsbruck as the standard instrument, be compared with an absolute instrument constructed according to an independent principle and asks the Meteorological Institute at Potsdam (in collaboration with the Physikalisch-Technische Reichsanstalt, Charlottenburg) to consider this question. It is important also that the question as regards the construction of an absolute standard, to be used only for standardizations, be considered, and the commission hopes the institute will attend to this question also.

Resolution V: The International Radiation Commission expresses the special wish that in all countries where scientific researches are pursued or will be pursued at stations for airplane flights the possibilities of making radiation measurements in airplanes will also be studied.

The commission is at present not able to recommend special instruments for the purpose, but asks that reports on the present status of work in this field be communicated to the president of the commission.

Resolution VI: The International Radiation Commission expresses the following wish:

It is very desirable that the spectro-pyrheliometric measurements be extended to different regions of Europe and especially to the mountain regions, which at present as regards such investigations are represented by Davos alone.

The commission will especially support the proposal that studies of the spectral distribution of solar radiation be extended to the Carpathian Mountains, to the Scandinavian Mountains and to the Brocken, and also to the mountains situated on the Mediterranean coast. The commission requests the president to put himself in communication with the meteorological institutes concerned in order to realize this project.

The preceding resolutions were signed by J. Maurer, Zurich, president; A. Ångström, Stockholm; L. Gorczyński, Warsaw; F. Linke, Frankfort; C. Schoute, de Bilt; C. Dorno, Davos; H. Hergesell, Lindenberg; Chr. A. Nell, The Hague; R. Süring, Potsdam.

Davos, at the Observatory of Dorno, September 2, 1925.



## ALASKA'S MILD WINTER OF 1925–26

By H. J. THOMPSON

[U. S. Weather Bureau, Juneau, Alaska]

Alaska, with an area of approximately 590,884 square miles, experienced the mildest winter in the history of Alaskan weather records, particularly so over the southeastern portion and the upper Yukon Valley. It must be borne in mind that the weather records in Alaska are not very old as compared with the stations in the States. On account of Alaska's shifting population and the slow means of communication from the remote parts, it is difficult to obtain long and continuous records from many localities of the Territory. There are, however, some long and accurate records for representative sections of Alaska. Sitka, in the southeastern portion, and one of the oldest permanent settlements in Alaska, has the longest weather records in the Territory, there being 44 years of temperature and 58 years of precipitation data. Most of the other stations have records averaging from 5 to 25 years.

Although November and December, 1925, and February and March, 1926, were very mild, special emphasis is laid on the phenomenally mild midwinter month, January, which is normally the coldest month of the year. This January, however, was the warmest on record throughout the Territory, except at Barrow, St. Michael, the Aleutian Islands, and the coast sections of the Seward Peninsula, where a few Januarys have averaged slightly higher. The January mean temperature